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Primary Neoplasms in the Kidney.

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THE HISTOLOGY OF TWENTY-NINE CASES OF PRIMARY NEOPLASMS IN THE KIDNEY.

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The pathology of tumours of the kidney is avowedly very obscure. There is no general agreement whether the infecting forms should beclassified among sarcomata or carcinomata. Various opinions are expressed concerning renal adenomata, many authorities holding that they may be arranged in two series—one springing from the tubes of the kidney, the other from some inclusion of tissue properly pertaining to the adrenals or to the Wolffian body. These, and other divergences of interpretation, issue partly from our imperfect knowledge of the embryology of the kidney, especially as regards the origin of the tubular epithelium. The fundamental question is—Whether this epithelium is epiblastic, and thus capable of producing true carcinoma, or mesoblastic, and thus apt to take part in the evolution of sarcoma. It is usually stated that the epithelium of the straight tubes is epiblastic, and derived from that of the Wolffian duct, whereas that of the tubes in the labyrinth is mesoblastic, formed by cords of cells appearing in the mesoblastic somites. But so excellent a pathologist as D. J. Hamilton declares without limitation that the renal epithelium is epiblastic, and classifies epithelia tumours of the kidney accordingly. Valuable light will probably be thrown on this question by examining a large number of primary renal neoplasms, in order to determine whether the activities of the connective tissue and of the epithelium are separable, or whether they are so closely inter-related, that all tumours of the kidney may be regarded as varying members of one great series. From this standpoint, we have examined twenty-nine examples of primary new growth in the kidney, which, with one exception, may be seen in the Pathological Museum of the University of Melbourne; and we propose to indicate the general characters, and to briefly describe the histological structure of each of these specimens.

Catalogue of Cases.

1. Lipoma (inactive).
2. Sarcomatous lipoma of hilum (active).
3. Multiple lipo-sarcoma (inactive).
4. Angioma (inactive).
5. Pure adenoma, with hyaline change (inactive).
6. Multiple papilliferous adenoma (inactive).
7. Papilliferous adenoma (inactive).
8. Multiple tubular adenoma (feebly active).

9. Tubular adenoma, with alveolar colloid development (inactive).
10. Cystic adenoma, at parts simulating carcinoma (feebly active).
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12. Multiple fibrillating spindle-celled sarcoma, with epithelial growth (feebly active).
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14. Adeno-sarcoma (active).
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20. Lympho-sarcoma (active).
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22. Large spindle-celled sarcoma (active).
23. Sarcoma carcinomatodes (active).
24. Sarcoma carcinomatodes (active).
25. Sarcoma carcinomatodes (active) in a case of old nephritis and perinephritis.
26. Sarcoma carcinomatodes (active).
27. Malignant adenoma [endothelioma] (active).
28. Myo-sarcoma (active).
29. Leucæmic kidney.

Description of Cases.

1. Lipoma (inactive), female, aged 57. This is a rounded lipoma of the cortex, about 1 cm. in diameter, lying immediately beneath the capsule and slightly prominent on the surface. The edge is well defined, but there is no visible capsule. The cut surface shows fatty tissue, with small opaque grey patches, and some dilated thin-walled vessels. Microscopically the general substance consists of fat cells supported by delicate connective tissue, but not arranged in definite lobules. The sections are traversed by bands of fibres and elongate cells supporting thin-walled vessels. The more opaque patches show abundant matrix, partly fibrillar, partly homogeneous, and in the meshes are found collections of nucleated cells, chiefly rounded and with intercellular substance between them, a few however being epithelioid and closely set. At the margin of the growth the microscope shows a slight imperfect capsule; but in some parts the fat cells abut directly on renal tubes. Around the edge there are large arterioles with thick walls, and likewise some fibroid glomeruli.

2. Sarcomatous lipoma of hilum (active). In a case of old hydronephrosis with fibroid change in the kidney, the organ is almost completely surrounded by a reniform mass of fat, 14 cm. long, 10 cm. broad, and over 6 cm. thick. The fatty mass is at most parts easily separable from the sub-peritoneal fat, retaining a definite outline and tumour form. The fat occupies also the whole hilum, blending thoroughly with the wall of the pelvis and with the renal tissue. The fat is firm, intersected by bands of fibroid tissue, and it contains considerable areas of boldly nucleated round cells. Embryonic tissue is also abundant where the fatty growth adjoins the proper substance of the kidney. Here it is largely composed of coarse spindles with fibrillar tissue.

3. Multiple lipo-sarcoma (inactive), male, aged 56. The kidney contains five small growths, all well defined but not encapsuled; all but one abutting on the renal capsule. The largest is 2 cm. in greatest diameter. Their cut surface is soft, partly granular, partly fatty. The left kidney contained one small growth of similar character. A microscopic section of a medium-sized growth shows it to be mainly composed of spindle cell sarcoma, mostly old and fibrified, partly rich in cells. Islets of fatty tissue are present here and there. At the margin there is at parts a copious growth of round cells. Here also there is evidence of activity in the neighbouring cortical tubes, and epithelial cells, or cells indistinguishable from them, may be found throughout the section. Arterioles with thick walls are very conspicuous around the edge of the growth. The suprarenal capsules both contained a growth of round cell sarcoma in the cortical substance, and there was a sloughing growth hanging from the soft palate. The columns of cells in the cortical substance of the suprarenal body do not closely resemble those found in any of the present series of tumours.

4. Angioma (inactive), female, aged 71. A rounded tumour, 2·4 cm. in diameter, extends from the capsule of the kidney, where it is slightly prominent, into the fat of the hilum. On section, it was originally spongy and full of blood; its edges are well defined, but not encapsuled. It consists of a larger superficial part and a small, deep part, between which runs a narrow fibrous-looking band continuous with the renal substance. A section has been made across this band showing both parts of the growth. Microscopically, the renal tissues show old chronic nephritis. Approaching the tumour the interstitial tissue becomes abundant, fibrillar and cellular, and the epithelial cells of the tubes, especially the straight tubes, become large, and their nuclei stain very deeply, so that many of these fields clearly resemble a tubular adenoma. In the fibrous band between the divisions of the tumour the tubules disappear, the capillaries begin to dilate, and the interstitial tissue is abundant, fibrillar, and thickly dotted with cells. These are mostly of rounded form, but many are spindles in the tougher parts. Approaching the main growths the capillaries dilate more and more, and open into one another, till ultimately there are large cystic cavities filled with blood, and networks of smaller intercommunicating vascular spaces. Blood pigment has been abundantly deposited in part of the interstitial tissue. The spaces are usually lined by the flattened endothelium of the vessels, but in some cases the lining cells are large and swollen, and here and there show globules, apparently of colloid.

5. Pure adenoma, with hyaline change (inactive). This is a regularly oval tumour nearly 2 cm. long and 1·3 cm. broad, embedded in the cortex of the kidney immediately beneath the capsule. It is soft, pale yellow, distinctly encapsuled and divided by slight septa into lobules. Microscopically it is coarsely alveolar, the walls of the alveoli being firm and fibrous. The alveoli are lined with very large epithelial cells, which have largely undergone a vitreous hyaline change. The cells are sometimes in a single layer, sometimes in several layers. They may even fill the alveoli, and fuse into a wrinkled mass. At the margin there is at parts a simple thick fibrous capsule; elsewhere the capsule consists of a close alveolar structure, sometimes even resembling lympho-sarcoma, but the cells in the meshes are largely of epithelial type. Around the tumour the arterioles are numerous, and have very thick walls.

6. Multiple papilliferous adenoma (inactive), male, aged 55. A rounded growth 2·5 cm. in diameter is embedded in the cortex immediately beneath the capsule. A smaller tumour is buried in the cortex closely adjacent. The cut surface is pale, pitted, and finely filamentous. The edge is well defined, but there is no capsule. Microscopically the main structure is a mass of thin-walled cysts, more or less completely filled with delicate papillary ingrowths. Cysts and papillæ are lined with epithelium in one or several layers, sometimes approaching a columnar type, sometimes irregular, sometimes large, flattened, and endothelioid. The core of the papillæ consists of delicate spindle cell tissue. At the margin of the growth there is rapid transition into kidney tissue. The adjacent kidney tubes are partly blocked up, partly dilated, the nuclei of their epithelium staining feebly. In some parts these tubes are in immediate relation with fully-formed papilliferous cysts, but in other parts intermediate structures are found—namely, tubes either dilated or not, but lined by active cells with deeply-staining nuclei; tubes more or less dilated and filled with cells having deeply-staining nuclei; and then cysts with papillary processes.

The other kidney contained similar tumours. The patient had lymphomatous growths in the groins, axillæ, and spleen. The liver contained several cavernous angiomata.

7. Papilliferous adenoma (inactive). Immediately beneath the capsule of a large red granular kidney there is a firm spherical growth, 2·2 cm. in diameter, slightly prominent on the surface of the organ. On section, the growth is greyish white, homogeneous, sharply defined, but not distinctly encapsuled. Microscopically it is a typical papilliferous adenoma of the tubular type. The tubules are cut in different directions—some transversely, others longitudinally, and they are closely set in a fibrillar stroma dotted with spindle-shaped nuclei. The tubules are lined with an irregular low epithelium, and are variously dilated into cysts. Delicate processes covered with similar epithelium have sprouted into most of the cysts, perhaps even filling them. Some of the processes are sessile, but others have only delicate stalks of attachment, and when these pedunculated processes grow freely in the cyst cavity they bear a striking resemblance to true renal glomeruli. In the larger cysts, however, the papillary growths become very complex by branching and mutual compression. The cores of the softer papillæ are composed mainly of delicate spindle cells, but those of the tougher ones show well marked fibrillæ. Here and there concentric colloid bodies are seen, some of them still having traces at their margin of epithelium belonging to aborted tubes. Arterioles and capillaries traverse the growth, but are not very abundant. At the margin the deeply staining tumour passes abruptly into the more feebly staining renal tissue. Along the line of junction there are numerous arterioles with thickened walls, some even being converted into solid fibroid tissue.

8. Multiple tubular adenoma (feebly active), male, aged 50. The kidneys are in an advanced stage of chronic nephritis, somewhat enlarged, with adherent capsules, granular surface, and many small cysts. One of them contains two small tumours; (*a*) abutting on the capsule, of flattened rounded form, 1 cm. across and ·5 cm. in thickness; this had a homogeneous fleshy section, and projected slightly from the surface; (*b*) buried in the cortex a short distance from the capsule, spherical, ·8 cm. in diameter, with a finely pitted cut surface. The former possesses a distinct fibrous capsule blending

superficially with that of the kidney. Sections consist of an irregular tubular gland tissue, the elongate tubes being bounded by thin walls of fibrous tissue, lined by one or several layers of epithelial cells with large oval nuclei. But over a great part of the section the tubules are filled with such cells, and the fibres bounding them are reduced to a minimum, producing an indistinctly alveolar tissue, somewhat resembling carcinoma. The alveolar walls contain many spindle cells. Some parts are more coarsely alveolar than others, and in these the large alveoli are firm walled, and lined by a single layer of cubical epithelium; but from the main wall a delicate network spreads through the alveolus breaking it up into smaller irregular spaces, lined by a softer, less definite, more rapidly proliferating epithelium. In certain places the growth has penetrated the main capsule of the tumour, and formed well-defined alveoli in contact with the renal tissue. The coats of the renal arterioles in the immediate neighbourhood of the tumour are immensely thickened. There are no distinct proliferous cysts, nor pseudo-glomeruli.

9. Tubular adenoma, with alveolar colloid development (inactive), male, aged 60. This large sub-granular kidney contains a strongly encapsuled spherical tumour 2 cm. in greatest diameter, abutting on the capsule of the organ, and boldly prominent on the surface. A smaller rounded tumour, ·8 cm. in diameter, also encapsuled, is buried in the cortex, but only partly separated from the main growth. Their cut surface is pale yellow, fleshy, with rusty streaks of old hæmorrhage and with conspicuous dilated vessels. Microscopically, at some parts, there are remains of a tubular adenoma lined by columnar nucleated cells; but for the most part the growth has become irregularly alveolar, the alveoli having thin walls of fibrillar and spindle cell tissue, and being more or less completely filled with irregular cells having large nuclei. These cells are largely undergoing colloid change, clear globules appearing, distending the cell and displacing the nuclei. Where the alteration is most advanced the resulting tissue resembles myxoma, but has been produced by progressive alteration of the alveolar epithelium. The capillary blood vessels are abundant, thin walled, often dilated or even ruptured. There are no proliferating cysts nor pseudo-glomeruli.

10. Cystic adenoma, at parts simulating carcinoma (feebly active), male, aged 67. This specimen came from an old man with enlarged prostate. The left kidney is in an extreme condition of hydro-nephrosis, with fibroid change and atrophy of the renal tissues. But it also contains a rounded tumour, 4 cm. in greatest diameter, bulging both beneath the capsule and into the dilated pelvis. On section, the tumour is sharply bounded and encapsuled, its cut surface being moderately soft, grey, finely pitted, with more homogeneous patches which are undergoing caseation.

A section has been taken from a part where a process of the capsule runs into the growth, branching out and carrying large blood-vessels with it. Here the dilated capillary vessels are very conspicuous, and also larger spaces filled with extravasated blood corpuscles, among which numerous blackened carrier cells may be seen.

In this case the fundamental tissue is tubular adenoma, with a lining of columnar cells. But it has been modified in two directions. The chief change is the development of cystic spaces, bounded by fibrillar tissue, processes of which extend into the spaces. The spaces and the processes are lined by epithelial cells, which tend to become swollen by colloid change. The processes sometimes fill the spaces and fuse into a pseudo-alveolar tissue. The other and less extensive modification presents a minimum of cyst

development, and produces an indistinctly alveolar tissue, in which the cells are largely colloid, and which at first sight closely resembles carcinoma. It will be noted, however, that the tumour is almost certainly of slow growth.

In the fibrous framework of this specimen many large pseudo-glomeruli are embedded.

11. Tubular adenoma, growing freely, becoming cystic and hæmorrhagic, male, aged 39. The inferior end of this kidney is replaced by a lowly lobulated growth, 10·7 cm. long and 6 cm. in thickness, which projects slightly under the capsule and bulges into the hilum, projecting by a conical process into the pelvis. On section, it is elastic and lobulated, the septa being greyish white and firm, while the lobules are rounded, 1 or 2 cm. in diameter, softer, pale yellow, and pitted or granular. Microscopic sections have been taken from the edge. The lobules are bounded by firm fibrous tissue, and consist of tubules variously dilated into cyst-like spaces. The tubules have a thin basement membrane, and are lined by more or less regular broadly columnar epithelium, with large nuclei lying near the attached end of the cells. The cystic spaces also are at first lined with epithelium, less regular in form and arrangement; but the larger spaces are separated only by thin walls, lined on both sides by one or more layers of large epithelial cells showing advanced hyaline change. In the most advanced parts the septa are largely broken down. Many of the spaces are full of blood.

At the margins of some of the lobules the tubules are not dilated, but are straight or curved in correspondence with the lobular edge; their epithelium is disposed in one symmetrical layer nearly filling the tubule. The adjacent renal tissue shows advanced fibroid changes, the tubules being much compressed, though their epithelium often continues active, so that lines of deeply-stained epithelial cells are often seen embedded in fibrous tissue. At the edge of the tumour the fibrous tissue forms a kind of capsule, becoming very dense; but here also relics of tubes persist, active epithelial cells in small lines and groups being dotted here and there, and again becoming more prominent near the adenoma growth. Some parts of this tissue closely imitate carcinoma. At other parts of the margin the cells are very numerous and disposed in more sarcomatous fashion without definite grouping and with intercellular substance between them.

12. Multiple fibrillating spindle cell sarcoma, with epithelial growth (feebly active), male, aged 68. This kidney contains two small independent tumours rising boldly beneath the capsule. The larger consists of a superficial and a deep part. The former is 2·3 cm. long and 1 cm. thick, and lies almost completely outside the line of renal tissue, but it is continuous with the deep part, which is wholly embedded in the kidney substance, and measures 1·5 cm. in length by 1 cm. in thickness. The smaller tumour resembles the superficial parts of the larger growth. On section, the substance of both is firm, grey, fasciculated, well defined, but not distinctly encapsuled.

Microscopically they consist of fibrifying spindle cell sarcoma, but epithelial growths are scattered here and there, sometimes in great abundance. These growths are partly in the form of imperfect tubes or cylindrical columns of cells, but partly form irregular infiltrations resembling carcinoma in arrangement, though without signs of active spread. A few small cyst-like dilatations are also present, lined with proliferating epithelium, processes of which may fill the cyst.

In general appearance these growths are perfectly innocent.

13. Adeno-sarcoma (feebly active), male, aged 20. A rounded tumour 2·2 cm. in diameter is deeply embedded in the substance of the kidney abutting on the sinus. On section, it is soft, grey, not encapsuled, with a pitted surface. Microscopically it shows areas of round cell sarcoma intersected by fibrillating bands of spindles. The vessels are delicate, and bounded only by spindle cells. But there are also great numbers of epithelial tubes, some sharply bounded by basement membrane, others less defined forming solid columns of epithelium, and these pass into vague epithelial infiltrations, where epithelial cells are massed together confusedly, or lie in the meshes of a fibrillar tissue blending with the sarcoma tissue. Attempts at cyst formation are present at intervals. Some of the epithelial infiltrations simulate carcinoma, but microscopically the tumour has no appearance of malignity.

14. Adeno-sarcoma (active), male, aged 51. The right kidney is large, pale, firm, with adherent capsule and numerous small cysts. On its anterior surface projects a rounded lowly nodular growth about 6 cm. in diameter and 5·5 cm. in thickness. It extends through the substance of the kidney so as to present into the pelvis. The presenting part has a comparatively narrow attachment to the main growth, but has grown within the pelvis into a flattened ovoid polypus nearly 4 cm. long and 2·5 cm. in greatest width. The cut surface of the main growth is pale, grey, largely mottled with rust-coloured patches. It is firm to the touch, but coarsely porous. Microscopically two kinds of tissue are present, adenoma and sarcoma. The adenoma tissue is arranged in bold alveoli, bounded by dense fibrous tissue with spindle cells, and lined by huge nucleated epithelial cells in one or many layers. The alveoli are more or less completely filled with proliferous papillary growths also covered with similar epithelium, and containing only a slight core of fibrils or spindle cells. Masses of epithelium often grow on these papillæ.

The epithelium does not appear to be absolutely discontinuous with the walls of the alveoli; for the inner layers of these walls become more and more infiltrated with cells, at first small and staining deeply with carmine but gradually passing into the large epithelial plates of the alveoli, of which only the nuclei are stained.

The sarcoma tissue is composed of rounded and spindle cells, at parts strongly fibrified, and with numbers of well-developed glomeruli, as well as others that have become fibroid or almost homogeneous. Amidst the sarcoma tissue are patches of epithelial cells; and by fibrillation of the sarcoma tissue and development of the patches of epithelial cells the sarcoma part merges into the adenomatous part. Blood vessels are abundant, and granules of altered blood pigment are scattered here and there.

15. Hæmorrhagic adeno-sarcoma (active), female, aged 22. In the upper part of the left kidney there is an oval partly encapsuled tumour 9 cm. long and over 6 cm. broad. On section, it is distinctly lobulated, some of the lobules being soft and fleshy and others hæmorrhagic. The hæmorrhagic portions are in several instances enclosed in dense subordinate capsules. The softer parts show an obscurely pitted or papillary character. Beyond the main capsule soft growths of a similar character are found in the kidney substance. Extensive infiltration has occurred in the glands of the hilum and the retroperitoneal glands. A massive growth is present on the left side of the neck adherent to the great veins, with consequent thrombosis. Copious growth in the mediastinum, especially around the left pulmonary vessels, led to collapse of the left lung. The liver is full of soft nodules, more or less confluent.

Microscopically the renal tumour is very largely composed of papillary adenoma, with extensive hæmorrhage into the cyst cavities. There are also areas of sarcoma and myxosarcoma, with rounded and elongate cells lying in a reticulum of varying closeness. A section of one of the smaller growths in the kidney shows the renal tubes in close relation to the tumour elements. Some of the tubes pass into the sarcomatous tissue, losing their basement membrane, the cells remaining active and becoming indistinguishable from the sarcoma cells. *(Figs. 1, 2, and 3.)*

16. Adeno-sarcoma taking carcinomatous form (active). In this case the kidney from a man, aged 46, is replaced by a rounded, lowly lobulated tumour, weighing 46½ ounces (1·5 kilos.), measuring 13·5 cm. in length, 12·7 cm. in breadth, and 8·5 cm. in thickness, filling the hilum, and sprouting boldly into the pelvis. Cylindrical processes ·5 cm. thick were passed in the urine.

On section, the superficial part of the growth is fairly firm, yellowish, indistinctly lobulated, and semi-caseous. The deep part towards the hilum is soft, lobulated, with an appearance that, even to the naked eye, suggests minute papillary cysts. Microscopically, the growth presents very varied types of tissue, among which the following may be mentioned :—

(*a*) Large spindle cells, either closely set or lying in a delicate fibrillar substance.

(*b*) Adenomatous epithelial formations, either regular and circumscribed, or diffuse and resembling carcinoma.

(*c*) Transitions between the foregoing. Thus the adenoma in part consists of irregularly swollen tubes, lined or filled by large boldly nucleated epithelial cells, and having a distinct basement membrane. Such regular formations may pass into diffuse epithelial infiltrations, with clumps of epithelial cells lying in the meshes of a fibrillar tissue, and thus assuming carcinomatous forms. These again pass into more vague infiltrations, with similar cells arranged singly, with fibrillar or other intercellular substance between them. And these vague infiltrations merge into sarcoma tissue, the broad epithelial cells becoming elongate and passing into spindles, which may be disposed in open fashion, or in close aggregations. Here and there cystic spaces occur, bounded by fibrillar tissue, and lined by large epithelial cells, columnar, pear-shaped, or broadly flattened. Not a few of these spaces contain papillary growths, covered with epithelium. Some of these epithelial cells possess distinct outrunners continuous with the fibrillar tissue. Even in the more confused parts of the section, it is common to see a fibrillar core surrounded by epithelial cells. *(Fig. 4.)*

The processes that came away in the urine showed a similar structure; partly a tissue consisting largely of epithelium, sometimes with a more or less definite alveolar arrangement, and partly of papillary growths in which a fibrillar or myxomatous core containing one or more capillaries is covered with epithelial cells. Some of these capillaries are in the closest relation with the epithelial cells, which are arranged around them radially, as in cylindroma.

17. Round Cell Sarcoma (active). This kidney is from a child. The tumour is of broad oval form, flattened from before backwards, measuring 18·3 cm. long, 17 cm. broad, and 11·4 cm. thick. It is of soft elastic consistence with large areas of hæmorrhage. Microscopically it consists of

round cell sarcoma tissue, intersected by bands of spindle cells. The sarcoma cells have very large round nuclei, but the cell substance is relatively scanty, and the outlines of the cells feebly defined. In the areas of hæmorrhage hyaline changes have occurred, forming heaps of large colloid-looking globules, or crenated masses of similar substance.

18. Cystic Round Cell Sarcoma (active), male, aged 3. The right kidney contains a rounded nodular mass of soft sarcoma 13 cm. in greatest diameter, varying in consistence, with a few cysts of considerable size in its substance. Its margin is for the most part ill defined, and the growth has filled the hilum. The sarcoma is of round cell type with bands of spindles, and with areas of loose fibrillar tissue containing spindle cells. At the margin some epithelial cysts may be found, the epithelium multiplying, and its progeny apparently blending with the other elements of the tumour. The left kidney was slightly affected with similar growth, and the lungs and liver were studded with soft growths.

19. Lympho-sarcoma (active), male, aged 69. The upper end of the kidney is occupied by a tumour partly smooth, partly lowly nodular, which extends much further down the inner than the outer side of the kidney. It is included within the same capsule as the kidney, but is partly deliminated by an irregular furrow, having here somewhat the appearance of an accretion to the kidney, and not a true renal growth. It is 5·8 cm. long on the inner side of the kidney, 5·5 cm. on the outer side, and over 3·5 cm. in thickness from before backwards. On section, it is incompletely lobulated, yellowish, partly firm, partly soft, with a wavy outline where it becomes abruptly continuous with the renal tissue. The cut surface is intersected by curved bands of fibrous tissue, and is dotted with dilated vessels.

Microscopic sections vary greatly in different parts, and chiefly according to the development of the stroma. In the firmest parts it is almost homogeneous, closely felted, sometimes even approaching in character to fibro-cartilage. The loculi here contain cells chiefly branching, the outrunners of which join with the stroma. In the softer parts the stroma is less abundant, and its bundles become fibrillar and then pass into spindle cells, the outrunners of which help to form a delicate reticulum. Embedded in this reticulum are cells, the nuclei of which stain more deeply, varying in form, usually small, but sometimes large or even epithelioid, and perhaps showing colloid change. In the most typical parts, round and spindle and branched cells are variously mixed together. Capillaries are numerous and often greatly dilated, and extravasations are occasionally met with. Islets of involuntary muscle-fibre are present, but few in number, and these chiefly connected with the vessels.

20. Lympho-sarcoma (active), female, aged 5. There is a nodular growth 18 cm. long and over 14 cm. in greatest thickness. The cut surface is divided into rounded lobules of varying size by reticular bands of tough white tissue. The lobules are soft and yellowish, with a tendency to softening and cyst formation. One lobule is entirely hæmorrhagic. At one part of the surface a small area of kidney tissue is visible. The tumour lobules adjacent to this area have well-defined rounded margins and thin firm capsules.

A microscopic section shows the main structure of the lobules to be lympho-sarcomatous. At parts there is typical lymphoma tissue with a fine open reticulum, and with round cells lying isolated in the meshes. But, as a rule, though the reticulum is distinct the cells are more abundant and less regular in shape. Here and there the lymphoma tissue passes into

myxolipoma. The bands between the lobules consist of fibrous tissue and spindle cells, the bands varying greatly in thickness. Patches of brownish yellow pigment are numerous. The arterioles have extremely thick walls, and the intima is sometimes greatly developed, even forming quasi-columnar cells. In certain areas remains of tubes may be seen with altered epithelium, partly degenerating, partly multiplying, and epithelioid cells are very distinct in many parts of the reticular tissue.

21. Mixed Cell Sarcoma, with tubular changes (active), male, aged 26. This specimen is from a large, soft, infecting tumour occurring in a young adult. The kidney was not preserved, but a microscopic section shows sarcoma tissue varying from the round cell to the fibrifying spindle cell type. Embedded in the sarcoma tissue are tubules and tufts partly undergoing atrophy, partly showing active development. In some of these tubules the nuclei of the cells stain deeply ; in others the basement membrane has disappeared, leaving a concentric solid clump of cells ; in others the cells in a clump have taken spindle shape, or even become greatly enlarged and pyriform. In the tufts the developmental changes consist in the presence of large deeply-stained nuclei, and in marked proliferation of the cells lining the capsule, so as to assume broad endothelial forms.

22. Large spindle cell sarcoma (active), female, aged 42. A large, soft, rounded tumour 9·6 cm. in length has replaced most of the kidney substance, and in parts has burst through the capsule of the organ. On section, it has a fairly well-defined edge, but is not encapsuled. The pelvis is compressed but not invaded. Patches of softening are scattered through the growth. Secondary tumours were present in the lungs.

Microscopically it is a large spindle cell sarcoma. The older parts show remains of kidney tissue, and have undergone partial fibrillation. The Malpighian tufts have also become fibroid. The straight tubes are chiefly atrophied, but some retain their epithelium with deeply-stained nuclei. Similar epithelioid cells, enlarged and active, are found solitary or in clumps amidst the sarcoma tissue, producing in places a decidedly carcinomatous appearance.

The growths in the lungs are also spindle-celled, but not of so pure a type as that found in the kidney.

23. Sarcoma carcinomatodes (active). This specimen is from a man, aged 20, and consists of a large, soft, rounded growth, 13·3 cm. in length, occupying all the upper part of the left kidney. It is fairly well outlined, but not encapsuled. On section it is partly caseous, partly hæmorrhagic ; the pelvis is compressed but not invaded. The lower part of the kidney shows numerous diffuse nodules of soft elastic growth, ill defined, and tending to become confluent. There were secondary growths in the retro-peritoneal glands, a few nodules in the lungs, and multitudes of small growths in the pleuræ. The liver was thickly studded with soft white growths individually of small size, but frequently running together into large masses only vaguely defined from the hepatic tissue around. This organ weighed 6·5 kilos.

Microscopically, two kinds of tissue are present, one derived from tubular epithelium, and the other from connective tissue. The two kinds are blended together in varying proportions, and each presents varying degrees of development. The simplest form in which the epithelial type predominates shows tubes cut in various directions, and lined by a variable but active epithelium, with boldly stained nuclei. These tubes have a basement

membrane, and are supported by a fairly abundant fibrillar tissue containing spindle cells. In other parts these tubes tend to dilate into cystic spaces, often lined with elongate epithelial cells, which may be several layers deep, with a tendency to papillary growth. Such cysts, however, are few in number. A more extensive change is seen where solid clusters of epithelial cells, arranged in alveolar fashion, occur abundantly in a fibrillar matrix. In large areas these epithelial cells almost fill the field, escaping from the alveoli, but now behaving more like the elements of a sarcoma, not being packed together, but with a fine intercellular substance between them.

The other kind of tissue, derived from the connective stroma, plays on the whole a minor part. It chiefly forms the matrix between the glandular tubes or cysts or diffuse epithelial growths, being mainly fibrillar with spindle cells, but sometimes though rarely crowded with round cells. Here and there it forms the chief element in large areas. The principal part of this tumour, therefore, consists of large epithelioid cells derived from the tubular epithelium, growing diffusely in a delicate connective tissue matrix, and being arranged like sarcoma cells, with vascular spaces between them, so as to come into close relationship with the circulating blood.

The lungs are thickly sown with minute growths, in which the cells are in immediate relation with the vessels; but the cells are largely epithelioid in type, with large oval nuclei and distinct nucleoli; and here and there may be seen attempts at papillary cyst formation. Between the groups of epithelioid cells there is scanty fibrillar tissue with spindle cells; so that both the elements of the renal tumour appear to have been reproduced in the lungs. The secondary growths in the liver present essentially the same characteristics. *(Fig. 6.)*

24. Sarcoma carcinomatodes (active), male, aged 62. The kidney is largely converted into a lowly lobulated tumour, and now measures 15·3 cm. in length, 10·3 cm. in breadth, and 7·8 in thickness. At the upper part some renal tissue still remains; below this there lies the main mass of the tumour bulging superficially under the capsule, and deeply infiltrating the pelvis, fungating into its interior, and plugging the renal veins. Still lower the kidney tissue reappears, but is infiltrated with soft nodular out-growths from the main mass. The main tumour shows in part of its surface a large area of opaque white fibroid substance containing small cysts and with outrunners passing into the softer part of the tumour. Otherwise it is yellowish and semi-caseous, but interseeted by lines of whitish fibroid tissue. The softer recent nodules also display a fine framework supporting a softer yellow tissue.

Microscopically the firm white fibroid substance consists of firmly fibrillated sarcoma, with a minimum of cells, but with numerous large, firm-walled capillaries. Near the soft parts the spindle cells become numerous, and still nearer these give place to rounded and epithelioid cells. The typical tissue in the softer parts consists of very large irregular epithelioid cells, either disposed in masses in sarcomatous fashion with embryonic vessels passing among them, or lying in a more or less alveolar fibrillated tissue. Even in the most alveolar parts the epithelioid cells are frequently furnished with out-runners, and are in intimate relations with the fibrillar tissue. The transition from cells of connective tissue type to alveolar type is sometimes clearly evident. Here and there, however, columns of epithelial cells are indistinctly visible, as if indicating an origin from primitive tubes. Much of the epithelium is degenerate, the cells containing numerous hyaline and fatty

globules. This tumour, therefore, consists of a sarcomatous tissue, the cellular elements of which are largely epithelioid, with a tendency at parts to imperfect alveolar arrangement.

25. Sarcoma carcinomatodes (active). This is an old specimen, of which no history has been preserved. It was labelled "Malignant and Suppurative Perinephritis." Sections now stain badly.

The kidney is converted into a gristly, partly cystic, substance, without great alteration in size, but it is embedded in a mass of softer growth which binds it to the aorta and surrounding structures. The gristly substance is chiefly fibroid, with relics of renal tubes; but at parts there is a mixed celled sarcoma, the cells lying separately in a fibrillar tissue. At parts the cells are distinctly epithelioid, either lying separately in similar fibrillar tissue, or forming small clumps in a more alveolar fibroid matrix. Even in this case the cells are closely related to the matrix, and transitional forms are seen between the more sarcomatous and the more carcinomatous parts.

Sections of the softer growth are more distinctly alveolar, but most of the contents of the alveoli have fallen out in the process of mounting.

The alveolar walls are mainly composed of delicate fibrillar tissue with numerous spindle cells, but at parts are more coarsely fibrous. The contents consist of large flattened cells, varying in shape, with slightly granular cell substance and bold nuclei. They are closely connected with the alveolar walls, into which their outrunners distinctly extend. The process may be traced in cells which rise up from the walls, either flattened or spindle or irregularly columnar or pyriform in shape; at first they are indistinguishable from the cells in the alveolar walls, but ultimately they appear to become detached through the growth of other cells beneath them. Some tracts of cells are not alveolar but diffuse, with delicate fibrillar tissue running between the individual cells; but the most definite tubes may be found opening out into continuity with such diffuse cellular formations. In some of the alveolar masses of epithelium extensive hyaline degeneration has occurred, and a few peculiar nests are also found where tubes or vessels have been blocked and converted into masses of concentric scales, at the margin of which new endothelial plates are actively growing and applying themselves in similar lamellar order.

26. Sarcoma carcinomatodes (active), female, aged 3. The left kidney is greatly enlarged: 14·3 cm. long, and 8 cm. thick. A section of it is mainly occupied by a soft yellowish growth, mostly granular, or finely pitted or dotted with minute cysts. The mass of the growth is traversed by branching fibrous septa, but the superficial parts are arranged in rounded lobules more or less distinctly enclosed by narrow fibroid bands. In the superficial parts areas of altered kidney substance are still visible, mostly composed of pyramidal tissue, and in connection with these areas some larger cysts have been developed. Some of the nodules of the tumour are soft almost to diffluence. The surface of the kidney is at parts nodular also, some of the more sharply defined nodules being sprouting processes of the growth. The hilum is filled with soft new formation, and this is continuous with a massive infiltration behind the peritoneum. The retroperitoneal growth is softer than that in the kidney, but similarly lobulated, and tending even more strongly to minute cyst formation. A nodule of similar substance is present in the hilum of the right kidney.

Microscopically, the tumour in the kidney presents an alveolar formation. The walls of the alveoli vary much in thickness, and consist of

fibrillar tissue with numerous cells, chiefly spindle, but partly rounded. This tissue is evidently highly vascular, and lines of blood corpuscles may still be found in it. Within the alveoli there are masses of cells with bold nuclei.

To this extent the tumour resembles carcinoma; but the cellular masses are not as a rule sharply defined from the alveolar walls. Fine fibrils penetrate the masses of cells, and embryonic vessels with blood corpuscles are also found among them. At the margins of many of the alveoli there is a distinct transition between the alveolar walls and the alveolar contents, the cells in the wall becoming plumper and more numerous, though still having distinct intercellular substance between them, and finally merging into the cellular masses within the spaces. In many areas also the alveolar formation is not well marked, and the cells, though plump and multitudinous, are not closely applied one to another, and in such parts embryonic vessels are in immediate relation with the cells.

The kidney substance has been converted into a fibrillar substance, with spindle cells and dilated capillaries full of blood corpuscles, and with relics of tubes and tufts, of which the epithelia are decidedly active. Near the tumour tissue, tubes may be found lined by active epithelial cells with deeply-staining nuclei, afterwards losing their basement membrane, and swelling into club-shaped masses of epithelium; and at all parts of the section a series of such swollen lines of epithelium merge into the alveolar formation.

The retro-peritoneal growth is not alveolar, but is lympho-sarcomatous, with a finely fibrillar mesh, in which cells of varied type are crowded together with embryonic vessels running among them. This densely cellular substance is intersected by more open tissue consisting of spindle or branched cells, with a fine fibrillar matrix; but, as in the renal growth, the two types of tissue are distinctly continuous one with the other, and are in no way comparable with the separate epithelial and connective tissue elements of true carcinoma.

27. Malignant adenoma (endothelioma), with sarcoma of stomach (active). This kidney, from a man aged 58, contains an oval growth 10 cm. long, 7·3 cm. broad, and nearly 6 cm. thick. At the upper and lower ends of the growth the renal tissue is still distinct. On section the tumour is well defined, and partly encapsuled; its cut surface is lobulated, soft, finely pitted, with patches of old hæmorrhage and caseous softening. A few distinct cysts are present in its substance and at its margin. A section has been cut, including a mass of hardened fibrin and patches of the soft tumour substance around. In some of the soft areas there is only a delicate fibrillar mesh, containing a variable number of endothelial cells, some of them small, others swollen into huge rounded or irregular plaques. Such a simple tissue is traversed here and there by rudimentary tubules, some destitute of cells, others having an imperfect endothelial lining. But other widespread areas are much more characteristic; these show a marvellous imitation of renal tubes, lined or filled by cells, and supported by delicate fibrillar tissue. With tubules and cystic spaces, bounded by a basement membrane, lined or filled with active epithelioid cells, there is a close resemblance to malignant adenoma or carcinoma. But closer examination shows that the whole tissue is mesoblastic. The cells within the basement membrane are epithelioid, not epithelial. The basement membrane is fibrillar, and connected with the fibrils of the supporting tissue, or even with outrunners of epithelioid cells in this tissue. When most of the cells have fallen out of the tube or cyst-like space, the remaining elements may be seen rising in epithelioid fashion on the inner surface, with outrunners prolonged along the basement membrane, and others become

produced in pyriform shapes retaining a narrow connection with the membrane. Scattered among the tubes are areas of diffuse endothelial growth. In some parts there are simply masses of nucleated endothelial plates, arranged somewhat in sarcoma fashion, with vascular spaces between them; in other parts the cells have become branched and united into a kind of open myxomatous tissue with embryonic vessels. Tubes open into both of these kinds of tissue, and cells lining the tubes become continuous with the cells of the tissue. *(Fig. 5.)*

The sarcoma of the stomach was apparently an independent growth of mixed-celled type, round and spindle cells and fine fibrils being blended together without any tubular or alveolar arrangement, and with embryonic vessels in immediate relationship with the cells.

28. Myosarcoma (active), male, aged 2.—A soft rounded growth, 12·6 cm. in diameter, completely replaces the right kidney, a still softer growth projecting in the position of the hilum. Microscopically it consists of spindle cells, with elongate nuclei, mostly lying isolated in a delicate fibrillar tissue, but at parts more closely clustered together. In these clustered parts a large number of the spindles show strongly-marked cross striation. Sometimes the striated spindles are compound, as if several had joined end to end, though the compound forms seem to have originated from elongation of single spindles, with division of the nucleus. Some of the striated spindles have widened out so as to have parallel borders. Another peculiarity of this tumour consists in the presence of foci of intense growth, of small round cells, composed almost entirely of a deeply stained nucleus. Here and there, but only sparsely, a tube may be found lined with active multiplying epithelium, with deeply stained nuclei.

29. Leucæmic kidney, female, aged 24.—In this case of leucæmia the spleen and lymphatic glands were greatly enlarged, but none of the organs showed any gross development of lymphoid tumours. In the kidney the microscope reveals a marked patchy development of lymphoid tissue, especially in the superficial parts of the cortex, with rounded and elongate cells lying in a fine fibrillar meshwork.

Conclusions.

From this series of cases we draw the following conclusions:—

(1) In an apparently simple lipoma of the kidney there are tracts of embryonic cellular tissue, mostly resembling round-celled sarcoma, but partly epithelioid. Some lipomata are progressive and infiltrating, and these contain a considerable admixture of sarcoma tissue, either round or spindle-celled. Islets of well-formed fatty tissue may be present in tumours which histologically resemble sarcoma, but the presence of such islets indicates comparative innocence.

(2) True angioma of the kidney may show all grades of capillary dilatation until networks of inter-communicating vascular spaces are formed. In the neighbourhood of a simple angioma, the epithelial cells of the renal tubes may be active, with deeply staining nuclei. Angioma must be distinguished from hæmorrhagic cystic adenoma, and from simple hæmorrhage.

(3) No definite line can be drawn between the various types of adenomata of the kidney. All our cases seem to originate in renal tubes, and not in adrenal or Wolffian inclusions. In not

a single instance is there the least resemblance to adrenal tissue. The simplest adenoma consists of tubes or alveoli lined or filled with large epithelial cells, which may become hyaline, colloid, or fatty. The softer forms are often composed of cysts with papillary ingrowths, the core of the ingrowths being sometimes fibrillar, sometimes embryonic and cellular, while the epithelial lining varies from a single layer of columnar cells to heaped-up layers of large flattened endothelioid plates. In some cases, many of the ingrowths are pedunculated, and grow freely in the cystic spaces, so as to produce pseudo-glomeruli. All stages may be traced of transformation from simple tubes into papilliferous cysts. Some adenomata are encapsuled, while others abut directly on renal tissue. The adjacent tubes are partly atrophied, fibroid, or otherwise degenerate, but partly show signs of epithelial activity, the nuclei staining deeply. In encapsuled adenomata, similarly active tubes, or cylinders of epithelium derived from tubes, may be found in the capsules. These capsular developments are worthy of close study, for sometimes the epithelial growth is so extensive and so irregular as to produce an alveolar structure resembling carcinoma or alveolar sarcoma, while the main tumour in its macroscopic characters continues perfectly innocent. In other cases, round and spindle cells may be so abundant in the capsule as to resemble sarcoma, but without any corresponding malignity.

(4) The pseudo-carcinomatous development, just described in the capsule of certain adenomata, may be the main histological type throughout a tumour. In this case the tubules or cysts are replaced by alveolar formations, the alveoli being bounded by finely fibrillar tissue with spindle cells, and being more or less completely filled with large irregular epithelioid cells, sometimes extensively colloid. These pseudo-carcinomata may remain small, inactive, and distinctly encapsuled. Such alveolar formations may occur side by side with the most typical papillary cysts. Not one of our cases of renal adenoma has passed into typical carcinoma, with corresponding malignant history.

(5) Adenomata of either the tubular or the papillary cystic type may grow freely and become hæmorrhagic. In some of these cases there is an admixture of ordinary sarcoma tissue, but progressive growth is not necessarily dependent on such admixture.

(6) Some sarcomata of the kidney, especially of the fibrifying spindle-celled variety, may remain small and inactive. In such small indolent growths there may be large epithelial developments, with distinct tubes, or columns of epithelial cells, or masses of epithelioid cells arranged in sarcoma fashion, or even an alveolar structure resembling carcinoma, but without any sign of active spread; or there may be cystic spaces, with or without papillary processes. Some of these indolent tumours are encapsuled, but others are not.

(7) In actively growing tumours there may be fairly pure sarcoma, or copious admixture of sarcoma with epithelioid growth. The purer types may be round-celled sarcoma, or lympho-sarcoma, or spindle-celled sarcoma, or some combination of these; and may be variously modified by hæmorrhage, caseation, cyst formation, &c., or, on the other hand, by fibrous, mucoid, or lipomatous development. Even in the purest types, evidences of epithelial activity are seldom wanting at the margin of the growth, and large endothelial cells are frequently found scattered in the sections.

In the complex types, the epithelial developments resemble those described in the complex inactive sarcomata and in the irregular adenomata, viz.:—

(*a*) Tubes variously dilated, and lined or filled with epithelium.

(*b*) Cysts lined by one or many layers of possibly huge epithelioid cells, and perhaps more or less completely filled by papillary growth.

(*c*) Solid epithelial cylinders, without basement membrane.

(*d*) Vague epithelial growths, the epithelial cells filling large areas, not being, as a rule, closely applied to one another, and being in intimate relations with embryonic blood-vessels.

(*e*) Similar epithelial growths, but with fibrillar matrix between the individual cells.

(*f*) Alveolar formations, in which, however, the epithelial cells are not always in contact, having in many cases distinct outrunners, and being evidently in close connection with the alveolar walls.

(*g*) Tubular or alveolar formations, in which the cells have a decidedly endothelial type, being developed in connection with the alveolar walls, and merging into diffuse epithelioid formations, which are not alveolar, and which have no likeness to carcinoma.

These varieties of epithelial development may constitute mere complications of sarcomatous growths; but in other cases they form the chief histological element of large malignant tumours. The typical adenoma and typical sarcoma both pass insensibly into these pseudo-carcinomatous structures.

(8) In actively growing sarcoma of the more infiltrating kind, renal tubes and tufts may remain amidst the embryonic tissue. In this case they may either atrophy, or may show developmental changes in their epithelium or endothelium.

(9) Particular attention should be given to areas of transition, in which pseudo-carcinoma merges into sarcoma, or in which distinct epithelial tubes pass into sarcoma. In the former case, discrete epithelial cells, lying clustered in alveoli, pass into cells with outrunners; some of the outrunners distinctly join the connective tissue matrix; other epithelial cells pass into long spindles, and becoming closely compacted together, blend insensibly with fibrillated spindle-celled sarcoma. On the other hand,

when epithelial tubes pass into sarcoma, the basement membrane disappears, but the cells remain active, forming solid cylinders, which swell out and become less and less definite, the cells fusing with the round-celled sarcoma tissue.

(10) Probably most of the epithelial cells in the vague infiltrations and alveolar formations are derived from tubular epithelium; but in part they are derived from endothelium of lymph spaces. In the case that we have named "malignant adenoma (endothelioma)," the endothelial origin was perhaps predominant.

(11) Even in tumours which in their histological character most closely resemble carcinoma, infection takes place in sarcomatous fashion. The lungs are usually the chief seat of infection, and the secondary tumours in the lungs are decidedly sarcomatous, though perhaps displaying attempts at the formation of epithelioid structures, such as papillary cysts, &c. The retroperitoneal glands are frequently converted into massive growths, but these also are modified sarcomata. In all secondary growths malignant cells will be found in immediate relation with embryonic blood-vessels.

(12) No case of dermoid tumour is found in this series.

(13) The general conclusion therefore is that, so far as new growths are concerned, the renal epithelium behaves as a mesoblastic and not as an epiblastic formation, and that the tumours most closely resembling carcinoma in structure are not carcinomatous in nature or history. Hence we have used the name "sarcoma carcinomatodes" to designate them.

(14) When a malignant tumour of the kidney fungates into the pelvis, large cylindrical processes may come away in the urine, and be mistaken for villous growths from the bladder. This is especially apt to occur in cases of "sarcoma carcinomatodes."

(15) Absence of capsule does not necessarily betoken malignity, or even progressiveness. A histological structure closely resembling carcinoma, with alveolar arrangement, large epithelioid cells, and bold nuclei, is compatible with clinical innocence. The macroscopic and clinical characters of the growth are of especial importance in estimating the malignity of any renal tumour.

(16) This series of cases includes one of rhabdo-myo-sarcoma, and other cases of sarcoma were associated with the presence of involuntary muscle fibres. Fibro-cartilage was doubtfully present in one case. It is wonderful that even more confusion of tissue does not occur, seeing that from the mesoblastic somites are evolved the vertebral column, the somatic and visceral muscles, as well as the pronephros, Wolffian body and kidney, and the peritoneal endothelium.

(17) The Pathological Museum of the University of Melbourne does not contain any specimen of lymphoma of the kidney, with nodules visible by the naked eye. But the last case of the series exemplifies the microscopic growths that occur in connection with leucæmia.

(18) The common little fibromata of the pyramids have been disregarded in this paper, as well as cysts and parasites.

(19) The cases now under review have not yet been studied sufficiently, especially from the clinical side, to permit a complete division of congenital from acquired tumours. It is noteworthy that the inactive neoplasms were in many cases multiple, while the active growths were usually single. A very marked feature of the inactive tumours is the presence of many very thick-walled arterioles immediately around them. The thickening affects all the coats, but the change in the intima is sometimes very striking, the endothelial cells assuming long columnar forms. Another interesting feature of the inactive tumours is their occasional association with other forms of morbid growth. Thus the case of multiple lipo-sarcoma of the kidney was associated with sarcoma of the corresponding adrenal, and a sloughing tumour of the soft palate; the case of multiple papilliferous adenoma presented multiple cavernous angioma in the liver, and lymphomatous growths in the groins, axillæ and spleen. Among the active tumours, the case of malignant adenoma [endothelioma] was complicated with mixed-celled sarcoma of the stomach.

Bibliography.—We do not propose to cumber this paper with a lengthy bibliographical criticism. We have made as complete reference as possible with the means at our command to the published cases of primary tumour of the kidney. Many of the early records are so imperfect as to be of no service in this inquiry. Even in cases of later date the difficulties have often been avoided. A large number of the more full and accurate records fall into line at once with our own observations; and we are not aware of a single fully reported case which clashes with our main conclusions.

PRIMARY NEOPLASMS OF THE KIDNEY.

Fig. 1

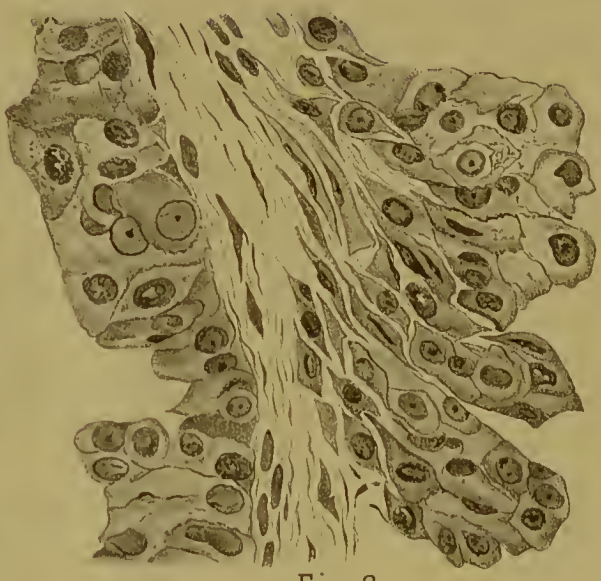

Fig 2.

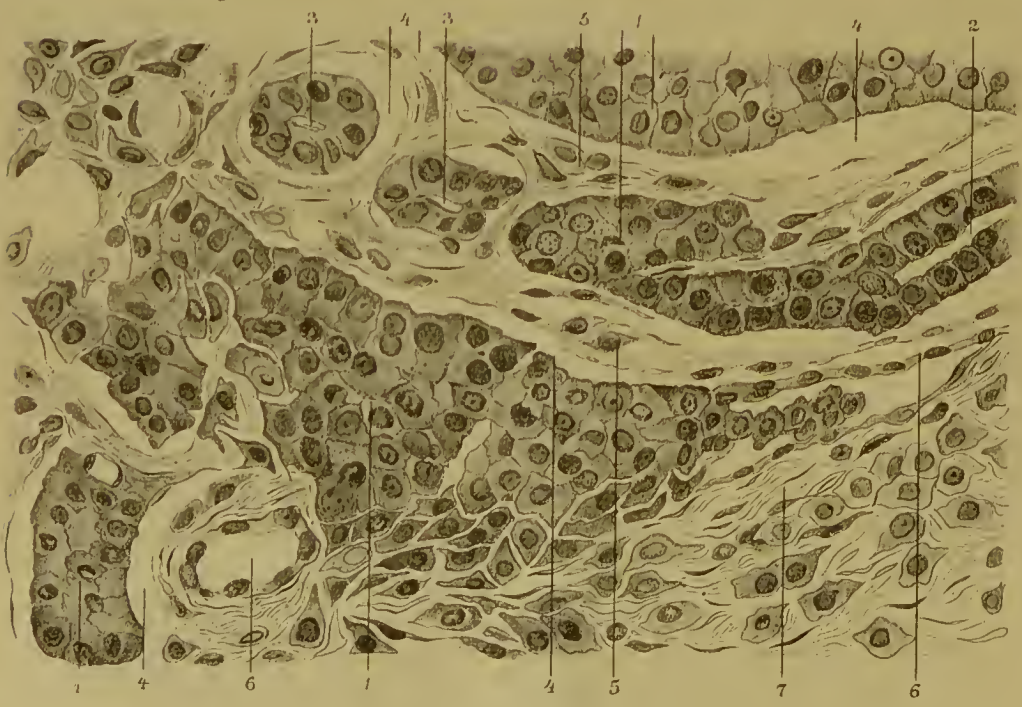

Fig. 3.

PRIMARY NEOPLASMS IN THE KIDNEY

Description of Plates I., II. and III.

Note.—These plates are intended to demonstrate the mesoblastic character of the renal epithelium. Transitional fields have therefore been chosen for this purpose, but it must be distinctly understood that areas having the typical structure of sarcoma or adenoma may be found in all the sections. The main features of each figure and the outlines of many of the cells are drawn with the camera lucida.

Fig. 1 Leitz Obj. 3, Oc. III. All the other figures Zeiss Apoch. Obj. 4mm., Compens. Oc. 4 (=252 diameters). Figs. 1, 2, 3, 4 and 6 Hæmatoxylin, Farrant's solution. Fig. 5 Borax carmine, clarified, Canada Balsam.

PLATE I

Fig. 1.—Portion of a hæmorrhagic tubular adeno-sarcoma (Case 15). To show the general relation of the growth to renal tissue, and the formation of the alveoli of the tumour from renal convoluted tubules. The structures shown in this figure merge insensibly into normal renal tubules beyond the upper limit of the plate. The rectangular portion inclosed in thin lines is shown more highly magnified in Fig. 3.

1—Cystic spaces of tumour formed by dilated tubules, many of which are filled with blood.

2—Imperfect fibroid capsule, partly invaded by the tumour, but to a large extent cutting it off from the renal tissue.

3—Renal tubules close to the capsule, taking on active growth, and appearing for the most part as solid cylinders of epithelial cells.

4—Transverse section of a tubule retaining its lumen.

5—Dilated lymph spaces surrounding most of the sections of tubules.

Fig. 2.—From the same section as Fig. 1. A portion of one of the septa separating the cystic spaces formed from dilated tubules, taken from a point a little beyond the lower edge of Fig. 1.

The central core of the septum is covered with epithelium on both sides. On the left the deep boundary of this epithelium is everywhere distinct; on the right the epithelium blends with the fibrillæ of the core, and many cells may be seen in the transition stage, both cells and nuclei becoming elongate, and fine processes passing from them to blend with the fibrillæ. The core itself contains oval or elongate nuclei which stain deeply and uniformly with hæmatoxylin.

Fig. 3.—The central part of Fig. 1 more highly magnified.

1—Solid cylinders of epithelium derived from renal tubules. Along the lower margin of the large central mass many of the cells are not in close contact, the fibrillar tissue penetrating here and there between them. This margin of the epithelium is ill-defined, some of the cells being spindle shape.

2—Longitudinal section of a tubule still retaining its lumen.

3—Cross sections of tubules with active epithelium and a small lumen.

4—Dilated lymph spaces surrounding the epithelial mass.

5—Epithelioid cells lying in delicate tissue between lymph spaces.

6—Blood vessels with very active endothelium.

7—This corner of the field consists of mixed tissue, epithelioid and spindle cells lying in a fibrillar matrix.

PLATE II.

FIG. 4.—From an adeno-sarcoma (Case 16). To illustrate the formation of spindle cell tissue and fibres from renal epithelium.

1—Alveoli cut obliquely, lined with epithelial cells, many of which are spindle shape. These cells blend with those lying in the surrounding tissue.

2—Alveolus cut transversely. The deeper layer of its epithelium partly consists of spindles.

3—Epithelial cells becoming spindle shape.

4—Bands of epithelial cells showing the same transformation into spindles.

5—A large plaque splitting into spindles.

6—A spindle splitting into fibres. The remains of two nuclei are seen at one end of this cell. Notice that as the cells elongate their nuclei become paler, and the chromatin remains only in the nuclear membrane and one or two nucleoli. As fibres are formed these nucleoli alone remain visible. At 7 a line of such nucleoli indicates the origin of the fibre.

FIG. 5.—From a malignant tubular adenoma (Case 27). Illustrating the epithelioid character of many of the cells lying separate from the main mass of epithelium.

1—Tubules with proliferating and œdematous epithelium, and surrounded by dilated lymph spaces.

2—Blood vessel (?) with swollen and partially detached endothelium.

3—Pavement masses of epithelioid cells, merging into a myxomatous tissue towards the left.

4—Swollen detached epithelioid plaques.

5—Swollen granular cells lying in the fibrillar matrix (? Wander cells).

PRIMARY NEOPLASMS OF THE KIDNEY.

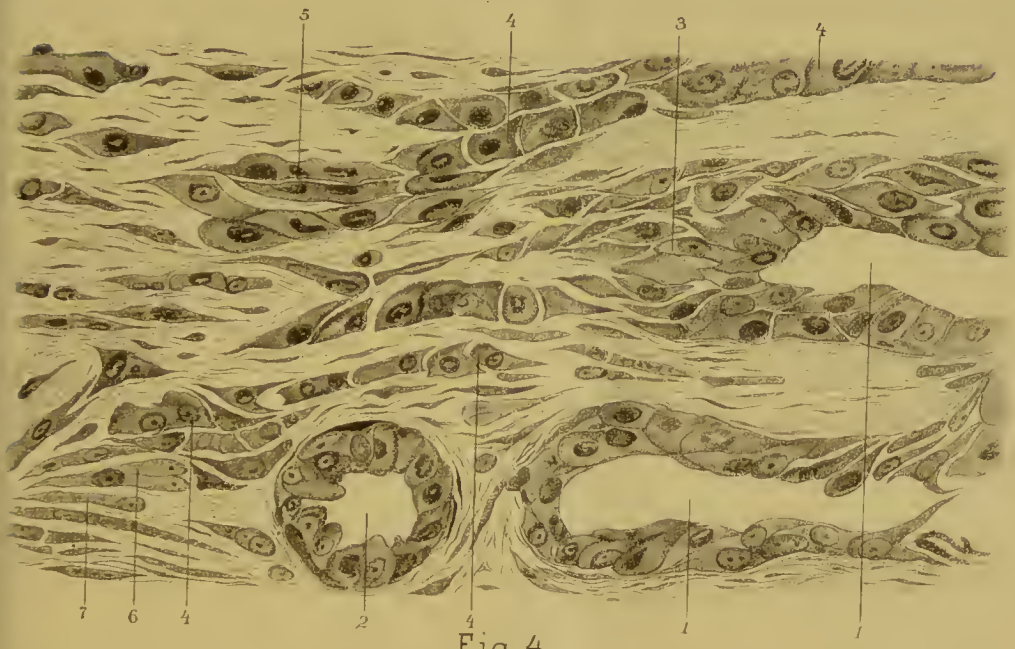

Fig. 4.

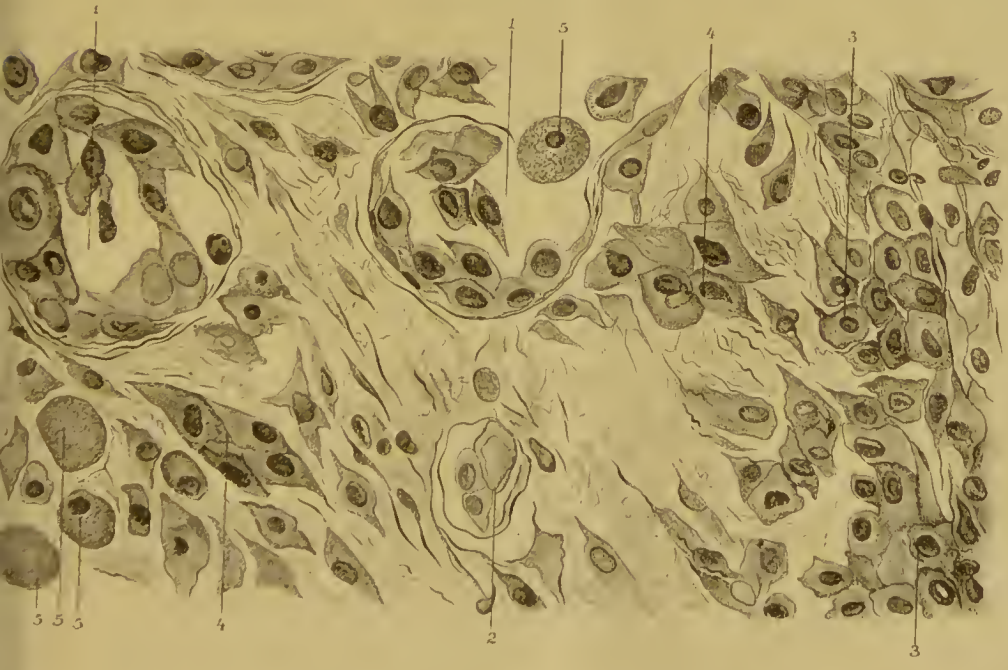

Fig. 5.

Troedel & C° print

R Wendel lith Melb

PRIMARY NEOPLASMS OF THE KIDNEY

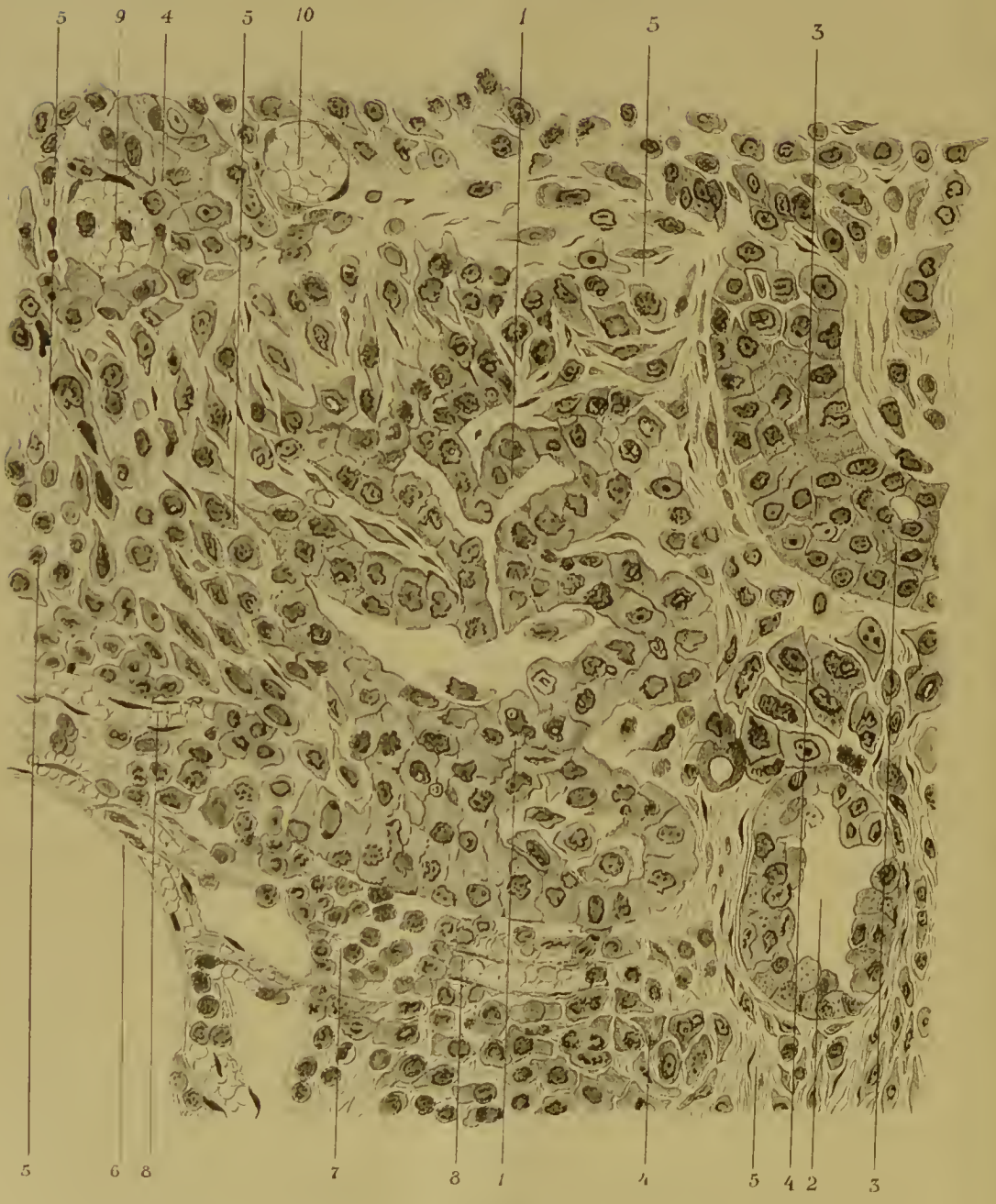

Fig. 6.

PLATE III.

FIG. 6.—Secondary tumour of the lung (Case 23). This figure illustrates the reproduction in the secondary deposits of all the features of the original renal tumour.

1—Mass of epithelium occupying the centre of the field. Papillary processes project into the small central open space. This mass of epithelium blends completely with the sarcoma tissue along its upper and left hand margins.

2—Epithelium reproducing the hollow tubules of the renal tumour

3—Epithelium reproducing the solid cylinders of the renal tumour. These cells are separating in the upper part of this mass, and finally become indistinguishable from the surrounding sarcoma tissue.

4—Isolated masses of epithelium, the outlying cells blending with the sarcoma tissue.

5—Sarcoma tissue. The cells are mostly of large size and round or spindle shape. The intercellular substance is faintly fibrillar.

6—Wall of an air vesicle with red blood corpuscles in its capillaries. These become lost in the mass of leucocytes.

7—Leucocytes at the edge of the sarcoma.

8—Capillaries in the sarcoma tissue.

9—Small vessel embedded in a mass of epithelial cells. There is hardly a trace of endothelium present, and the epithelial cells appear in closest relation to the circulating blood

10—Small blood vessel with nearly complete endothelium.